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A New Species of *Assara* (Lepidoptera, Pyralidae) Associted with the Aphid Gall

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Abstract *Assara formosana* sp. nov., associated with the gall of *Ceratoglyphina bambusae* on *Styrax suberifolia*, is described from Taiwan. The immature stages and remarks on the biology are also given.

Key words *Assara*, Pyralidae, gall feeder, aphidophaga, Taiwan.

A phycitine genus *Assara* numbers 15 species from the Palaearctic, the Oriental and the Australian Regions. The larvae of all the known species from the Palaearctic Region are the feeders on the cones of pinaceous trees except for *A. korbi*, an aphid-gall feeder (YOSHIYASU, 1986). On the other hand, the larvae of 2 known species from the Oriental Region are aphid-gall feeders (ZERNY, 1934; ROESLER, 1973; ROESLER & KÜPPERS, 1981).

Through the courtesy of Drs. U. KUROSU and S. AOKI, I had a chance to examine the immature and adult specimens of a phycitine whose larvae feed on galls of *Ceratoglyphina bambusae* on *Styrax suberifolia* in Taiwan. The species was already found by TAKAHASHI (1935; see also TAKAHASHI, 1930) as *Hyphantidium* sp. but it has been undescribed up to now. In this paper, I will describe it as new to science and comment on the biology and the habit as a feeder of the aphids.

Description

Assara formosana sp. nov.

Hyphantidium sp.: TAKAHASHI, 1935: 6.

Adult. Male, 8.5 (7.8-9.2) mm (n=6); female, 10.6 (10.0-11.3) mm (n=5) in forewing.

Male & female: Head with frons rounded, fuscous: vertex flat with light brown scales. Labial palpus in male narrow, acutely and roundly upturned, a little extending beyond vertex; 1st segment short and whitish; the 2nd about twice as long as the 1st, basally whitish and apically fuscous; the 3rd narrow, as long as the 2nd, fuscous. Labial palpus in female much longer than in male, obliquely extending upwards; the 2nd much long, whitish with fuscous scales; the 3rd shorter than in male, evenly fuscous. Maxillary palpus extending along labial palpus, moderate in length, fuscous. Proboscis short, about twice as long as length of eye. Antenna ciliate in both sexes,

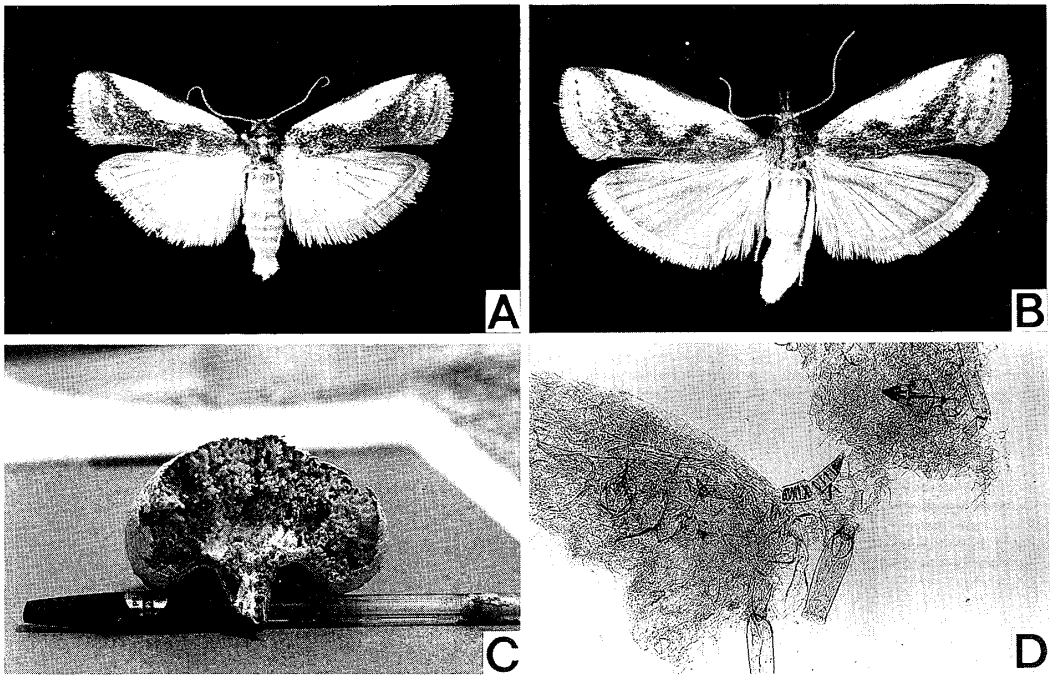

Fig. 1. *Assara formosana* sp. nov. A. ♂, holotype; B. ♀; C. Larval web inside a gall of *Ceratoglyphina bambusae* on *Strax suberifolia* (lower whitish portion, offered by Dr. AOKI); D. Midgut content of a larva (note the fragments of antennae, stylet and legs of aphids).

about 1/2 as long as forewing, dorsally with whitish scales; in male with a darker ring on each flageller segment. Thorax and abdomen above fuscous, with paler scales along posterior margin of each segment, beneath whitish ochreous.

Foreleg short, anterodorsal surfaces of distal 1/2 of coxa to tarsus dark brown; other surfaces whitish, sparsely scattered with dark brown scales. Midleg long, whitish except for tarsus dark brown on anterior surface; spurs dark brown, inner spur twice as long as outer spur. Hindleg a littel shorter than midleg; femur about 3/4 as long as that of midleg; mid inner spur about twice and apical inner one 1.5 times as long as each outer spur.

Wing shape and venation: Forewing with proximal portion of costa a little expanded anteriorly, apex rounded, termen weakly curved to broad tornus. Vein R_1 arising at proximal 2/3 of discoidal cell; base of R_{3+4} close to that of R_2, but distinctly separated; M_1 a little upcurved; bases of M_2 and M_3 approximated with each other, but not anastomosed. Hindwing with costa almost straight; apex pointed; termen sinuous. Vein Rs approximated with $Sc+R_1$ in its proximal 1/3 from discoidal cell; bases of M_{2+3} and CuA_1 close to each other (especially in male), but not fused*.

Wing marking: Forewing dark fuscous, with anterior portion to discoidal cell broadly suffused with silvery white, lunulate; discocellular lunule weakly appeared or absent; postmedial line weak, curved, zigzaged and dark brown, and accompanying a

*ROESLER (1973) offered the diagnosis on the venation of *Assara* that the veins M_{2+3} and CuA_1 in the hindwing are anastomosed at bases.

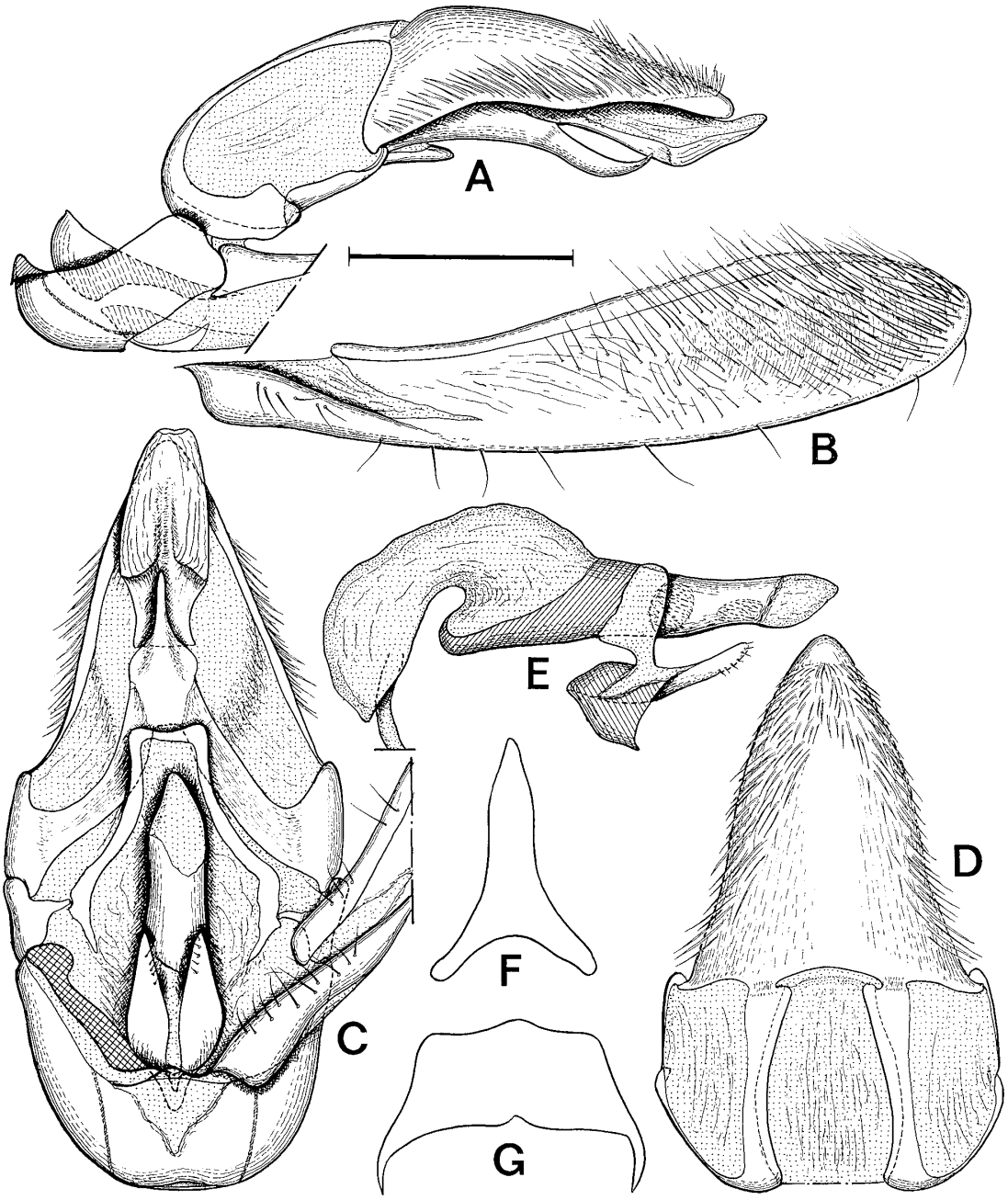

Fig. 2. Male genitalia of *Assara formosana* sp. nov. A. Lateral view, right valva removed; B. Right valva, inner view; C. Ventral view, left valva removed; D. Tegumen and uncus, dorsal view; E. Phallus with juxta, lateral view; F. 8th tergum; G. 8th sternum. Scale: 0.5 mm.

whitish line distally; submarginal area suffused with whitish scales; marginal line represented by darker spots on each end of veins. Hindwing evenly pale fuscous but darker along apex to termen.

Male genitalia: Tegumen wider than long, dorsally reduced to 2 lateral narrow bridges by medial membranous portion. Fenestrullae broad. Vinculum wide and short, with saccus poorely developed. Uncus broad and subtriangular dorsally, longer than tegumen, narrowly fused with bridges of tegumen at base, with many scale-like

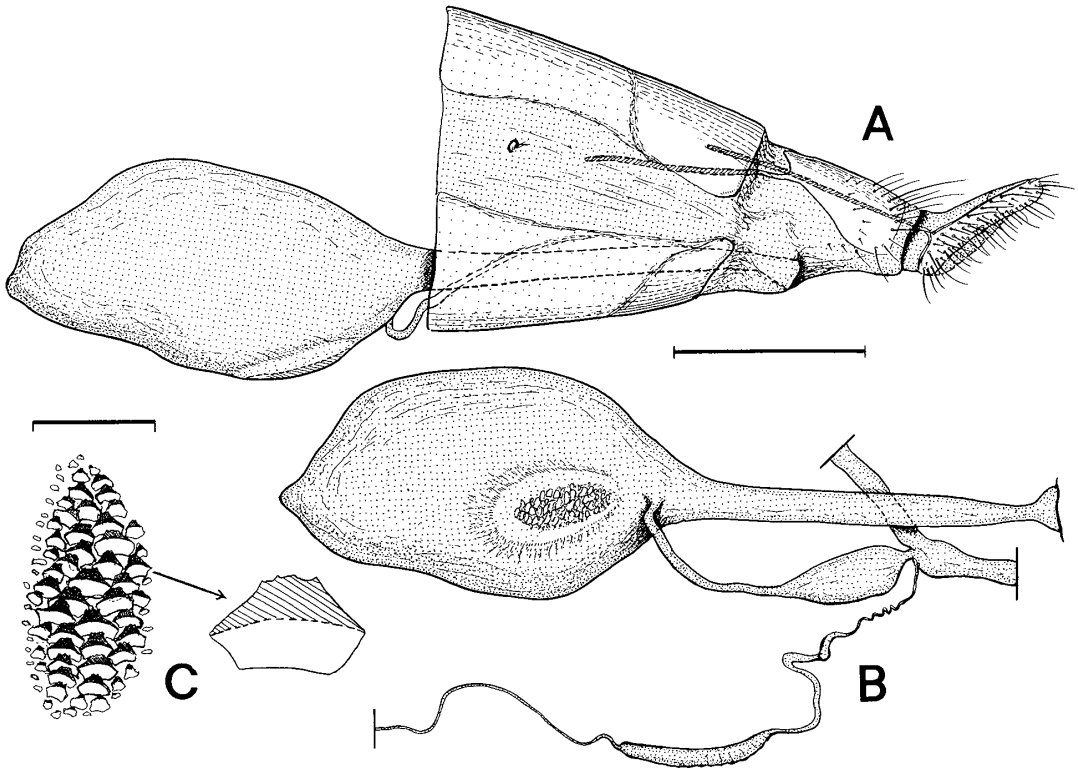

Fig. 3. Female genitalia of *Assara formosana* sp. nov. A. Lateral view; B. Ductus bursae and corpus bursae, ventral view; C. Signa. Scales: 1 mm for A, B; 0.25 mm for C.

setae marginally oriented anteriorly. Subscaphium distinct, connected with gnathos. Gnathos wide at base, with cochlear (gnathospaar *sensu* ROESLER, 1973) rather short and fook-like laterally. Valva slender and simple as in the other species of *Assara*, almost as long as height of ring, with many setae on the apical half. Phallus short and a little flattened; suprazonal sheath narrow; vesica with 2 groups of spinules. Juxta scissar-shaped, its distal portion with some short setae laterally. In addition, 7th tergum reduced to an inverted Y-shaped sclerite, and the sternum short and trapezoidal in shape.

Female genitalia: Ostium bursae narrow, ductus bursae long without a bursal ring as in the other species of *Assara*. Corpus bursae elliptical, with distinct signa consisting of several trapezoidal spines of which marginal ones are smaller. Ductus seminalis emitting from base of corpus bursae. Spermatheca without a pouch of lagena. Eighth tergum short, with several setae, of which posterior ones are longer; apophysis anterioris about 2/3 as long as 7th tergum. Papilla analis moderately developed; apophysis posterioris a little longer than the anterioris. In addition, both 7th tergum and sternum being membranous at anterior half.

Mature larva. Head width, 1.2 mm; body length, 13 mm (n=8).

Coloration: Head, prothoracic shield, anal shield and thoracic legs evenly pale brown. Mandible light brown. Thorax and abdomen creamy white. Setae light brown, being whitish apically. Pinacula pale brown.

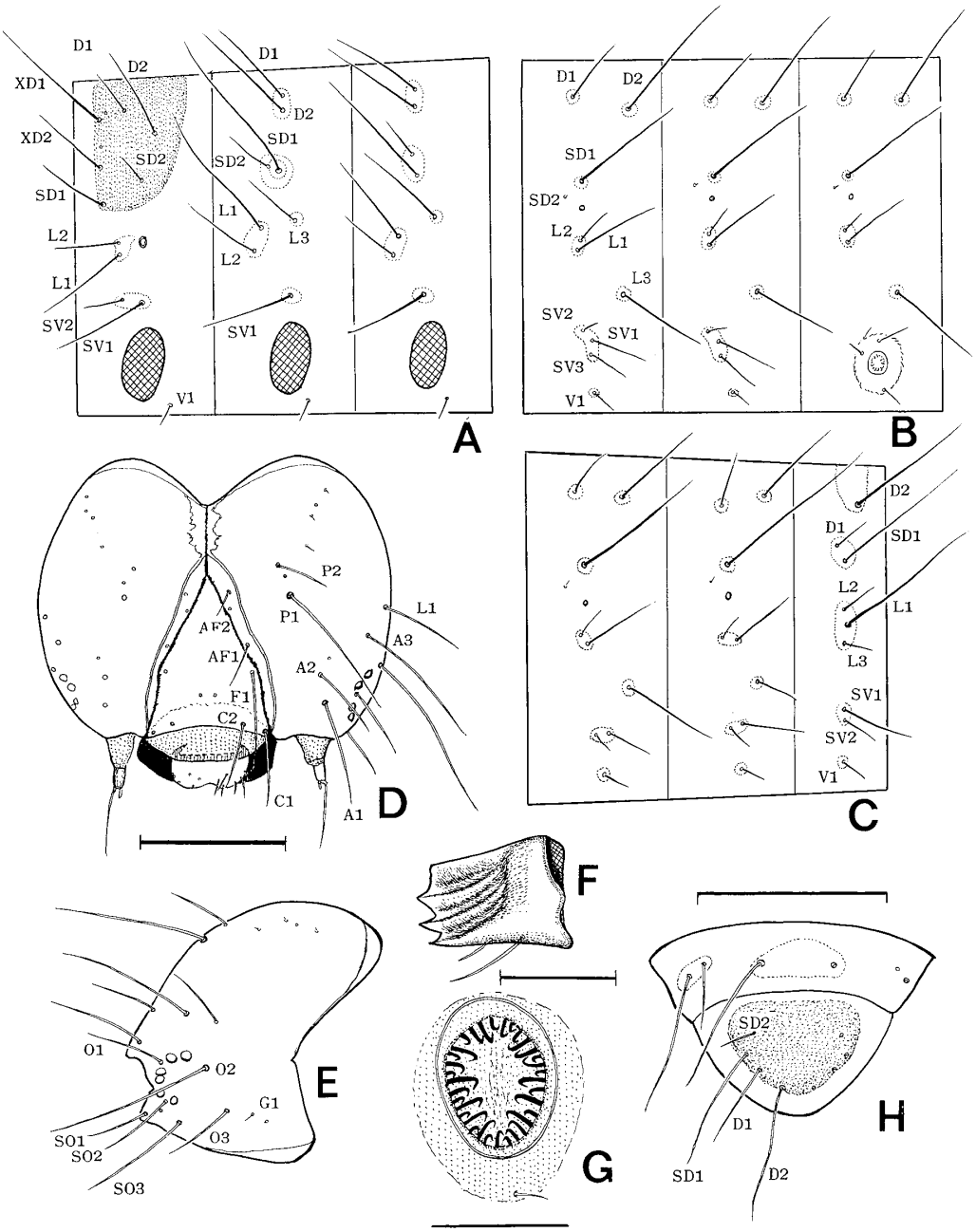

Fig. 4. Larva of *Assara formosana* sp. nov. A. Chaetotaxy, pro- to metathoraces; B. *Do*, 1st to 3rd abdominal segments; C. *Do*, 7th to 9th segments; D. Head, frontal view; E. *Do*, lateral view; F. Right mandible, inner view; G. Crochets of proleg; H. 9th to 10th segments, dorsal view. Scales: 0.5 mm for D, E; 0.25 mm for F, G; 1.0 mm for H.

General structure and chaetotaxy: Head a little wider than long; seta AF2 situated anterior to coronal suture, and much shorter than AF1; P1 thrice as long as posterior P2; A3 on a line between A2 and L1; O2 much long. Mandible almost rectangular with 3 teeth; posterior seta from the ventral margin longer than the anterior one. Ocelli 6 in number.

Prothoracic shield not so wide, with seta XD1 longer than XD2, which is subequal to SD1 in length; 2 L setae vertically arranged, with its pinaculum not so developed compared with the other *Assara* species. Mesothorax with D1 almost as long as D2; a ring-shaped pinaculum on SD setae weakly developed. Metathorax with setae as in mesothorax.

Abdomen with chaetotaxy as in the other *Assara* species except for weakly developed pinacula; seta SD2 much shorter than the other tactile setae; long setae a little curled distally. SV setae 3 in number on 1st to 6th segments, and 2 on 7th to 9th ones. Eighth segment with seta D2 situated more dorsally than D1; a ring-shaped pinaculum on SD not formed. Ninth segment with L setae arranged vertically. Tenth segment with anal shield with setae D1, D2 and SD1 situated marginally. Prolegs with crockets arranged in a uniserial circle, triordinal, about 35 in number. Anal prolegs with about 20 biordinal crockets.

Pupa. 8.4-8.7 mm in length, 2.0-2.2 mm in width (n=3).

Body a little thicker than wide, pale brown. Head with frons broadly rounded; pilifer not clearly marked; galea reaching proximal 2/3 of forewing; setae F3, P1, P2 present, thin; antennae extending near wing apex. Thorax wide, granulate dorsally; foreleg reaching just before wing apex; midleg rather wide; hindleg almost concealed

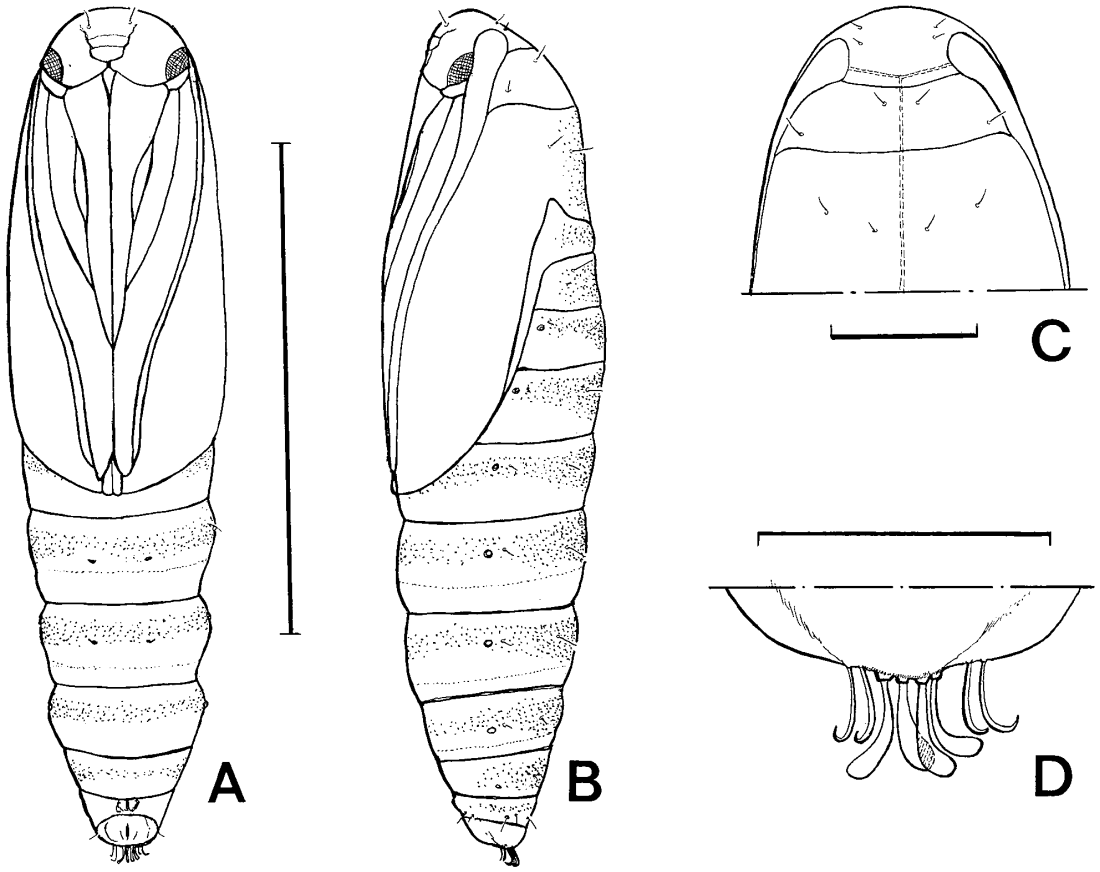

Fig. 5. Male pupa of *Assara formosana* sp. nov. A. Ventral view; B. Lateral view; C. Head to thorax, dorsal view; D. Cremaster. Scales: 5 mm for A, B; 1 mm for C, and 0.5 mm for D.

except for its tip near wing apex. Abdomen a little darker dorsally, with granulate punctures, especially denser on medial portion of each segment; spiracles small. Tenth segment with posterior margin broadly rounded, with 4 pairs of cremaster fooks, of which inner 2 pairs with distinct sockets are flat and roundly widened and curved apically.

Type series. Holotype, ♂, Puli, Nantou Hsien, Taiwan, em. 10. i. 1991 *ex* larva collected on 18. xii. 1990** (U. KUROSU & S. AOKI). Paratypes. 5 ♂ 5 ♀, same data as the holotype except the data of emergence (30. xii. 1990-11. i. 1991). The type is deposited in the Laboratory of Entomology, Kyoto Prefectural University (No. 248).

Distribution. Taiwan.

Remarks. The new species is allied to *A. holophragma* (MEYRICK, 1887) from Sumatra, in having the broad silvery white area in anterior portion of the forewing, the wide subtriangular uncus, the scissar-shaped juxta and the trapezoidal 7th sternum in the male genitalia. However, the new species is distinct from the latter as follows: 1) discocellular lunule weaker or absent in forewing; 2) cochlear shorter, juxta with some setae, phallus with spinules of cornuti separated into 2 groups in male genitalia; 3) signa consisted of a group of more distinct spinules in female genitalia. Furthermore, the new species differs from the other *Assara* species in the sexually dimorphic labial palpus.

Remarks on the biology of *Assara formosana* sp. nov.

As mentioned in the introduction, many species of the genus *Assara* are cone-feeders on pine trees (Table 1). However, the larvae of the new species are found in aphid galls of the tribe Cerataphidini on *Styrax suberifolia*: they make silken runways inside the galls and feed on the tissues (Fig. 1C). Although TAKAHASHI (1930) mentions

Table 1. Host plants of *Assara* species in the world.

Species	Host	Distribution	References
A. terebrella	*Pinus* spp., *Picea* spp.	Europe to Japan	HASENFUSS (1960)
A. hoeneella	*Pinus* sp.	China, Japan	ROESLER (1973)
A. funerrella	*Pinus thunbergii*	China, Japan	YOSHIYASU (1983)
A. conicolella	*Pinus* sp.	Europe	HASENFUSS (1960)
A. korbi	aphid gall of *Schlechtendalia chinensis* on *Rhus javanica*	China, USSR, Japan	YOSHIYASU (1986)
A. pinivora	*Pinus* sp.	Kashimir	ROESLER (1973)
A. tuberculosa	aphid gall on *Dipterocarkus tuberculatus*	Myanmar	ROESLER (1973)
A. subterebrella	aphid gall on "*Astegopteryx*" sp.	Sumatra	KARNY (1934)
A. formosana	aphid gall of cerataphidines	Taiwan	This study

**The permission for introducing the alive specimens from Taiwan to Japan was granted by the Kobe Plant Protection Station, Ministry of Agriculture, Forestry and Fisheries (No. 2042).

that the larvae do not seem to be feeding on aphids, there is no doubt that they feed on aphids because many chitinous fragments of antennae, mouthparts and legs of aphids were found from the midguts of the larvae (Fig. 1D). Furthermore, KUROSU and AOKI (pers. commun.) found a few young (probably 2nd-instar) larvae of the new species in silken runways formed a few cm apart from a gall of *Ceratoglyphina bambusae*; they probably preyed upon aphid soldiers roaming outside the gall.

Pupation also takes place inside the gall, making thick cocoons. Sometimes more than one pupa were found as a batch. Adult moths emerged in December and January. Since mature larvae and pupae have been found all the year round (KUROSU & AOKI, pers. commun.), it is likely that adults also appear in the other seasons. Galls of *Ceratoglyphina bambusae* last more than one year (KUROSU & AOKI, pers. commun.), and larvae of the new species were also found in galls of the cerataphidines, *Astegopteryx bambucifoliae, Pseudoregma shitosanensis* and *P. swinhoei* on *Styrax suberifolia* (my identification of the larvae collected by KUROSU & AOKI). *Assara formosana* sp. nov. may therefore propagate throughout the year in cerataphidine galls.

As far as I know, the aphidophagous habit has hitherto been reported in only two species of the subfamily Phycitinae: *Alophia combustella* HERRICH-SCHAFFER (BODENHEIMER & SWIRSKI, 1957) and *Dipha aphidivora* (MEYRICK) (YOSHIYASU & OHARA, 1983; ARAKAKI & YOSHIYASU, 1988). The new species is the third aphidophagous species.

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摘　　要

アブラムシの虫えいに寄生する *Assara* 属の 1新種（鱗翅目，メイガ科）（吉安　裕）

マダラメイガ亜科 *Assara* 属は旧北区から東洋区，オーストラリア区にかけて，15種が知られている．本属の幼虫は多くが針葉樹の球果を摂食する（ROESLER, 1973）が，一部の種はアブラムシの虫えいを食することが知られている（ZERNY, 1934; YOSHIYASU, 1986）．今回，本属の1新種を台湾から記載した．

新種 *A. formosana* は，ウラジロエゴノキ（*Styrax suberifolia*）にできるウラジロエゴノキアブラムシ（*Ceratoglyphyna bambusae*）の虫えいから見いだされたもので，すでに高橋（1930, 1935）によって，*Hyphantidium* sp. として知られていた．本種は，斑紋や交尾器の形態において，スマトラ産の *A. holophragma* (MEYRICK) とよく似ているが，前翅前縁に広がる銀白色の斑紋部がより広いことや，雄交尾器の juxta や phallus および雌交尾器の signa の形態などによって，区別できる．また，下唇鬚が，雄では上方に強く湾曲するが，雌では斜めに上向するという点で，本属の他種と異なる．

本種の食草であるアブラムシ科ヒラタアブラムシ亜科 Cerataphidini 族の虫えいは台湾では1年を通じてみられ，また本種の幼虫も各時期に採集されている．そのため成虫は年数回発生しているものと思われる．また，幼虫は明らかに虫えい内のアブラムシをも摂食しており，筆者の知るかぎり，第3番目の食蚜性マダラメイガとなる．

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